comparatively small number of pages. The book gives a better bird's-eye view of the whole subject than most recent works, and it has the great advantage that copious references make it possible for the student to consult the literature of the subject and supplement from original sources any lacunæ in Prof. Jones's presentation of facts and theories. W. R.

OUR BOOK SHELF.

Other Worlds. By Garrett P. Serviss. Pp. xv + 282. (London: Hirschfeld Bros., Ltd., 1902.) Price 6*s.* net.

WHO amongst us has not, at some time or other, considered the question of the possibility or probability of the habitability of the planets that pass across the face of our sky, and wondered whether any of these worlds is an "earth" with all her attendant phenomena? A very excellent account of our neighbours from this point of view will be found in the book before us, which, although it hails from the other side of the Atlantic, yet will nevertheless be welcomed, as it comes from the land where the most recent and very valuable work on the observations of the surface markings of the planets has been done. As has often been pointed out, it is not the large telescope that is necessary for planetary observation, but clear and still air, a comparatively small telescope, and an intelligent eye. In Arequipa the Americans have such a condition of atmosphere, and it is there that important observations of some of the planets have been made.

In the present volume the author gives the reader a very clear insight into the present condition, so far as can be gathered from observation, of each of the planets, and the information is conveyed in such an enticing manner that the book should be interesting reading to everyone. Besides being accurate, the contents are well up to date, as shown by references to Pickering's work on the observations, and deductions from them, of the lunar surface.

The concluding chapter gives a brief but sufficient account of the means of finding and recognising the planets when they are visible in the sky, and in this is included a set of charts of the zodiacal constellations to facilitate the work of a beginner.

Numerous well-reproduced illustrations, many from photographs and drawings made at the Lick Observatory, accompany the text, and the frontispiece shows the Martian surface as charted by Schiaparelli.

As a popular exposition of the degree of habitability of the planets the book is to be recommended, and the clear large print adds to the comfort of the reader.

The Basis of Social Relations. By D. G. Brinton. Pp. xvi + 204. (London: John Murray, 1902.) Price 8*s.* net.

The Criterion of Scientific Truth. By G. Shann. Pp. 51. (London: Cassell and Co., Ltd., 1902.) Price 1*s.* 6*d.*

THE persons responsible for the publication of the posthumous work of Dr. Brinton, described above, would have done better if they had taken a more comprehensive view of their editorial duties. As we are told in the preface, no attempt has been made at verifying references; so that we have highly debatable statements constantly made on such vague general authorisation as "Plato," "Wundt," "Quetelet," "an American scientist," and so forth. Curious inaccuracies in matters of fact have likewise been allowed to stand in various places, *e.g.* at p. 44, where we read that Crete was the source of "Greek law" (whatever that vague expression may mean), and a well-known citation from the famous Hymn of Cleanthes, occurring in the "Acts of the Apostles," is said to be from "a Cretan poet," and at p. 13, where it is asserted of Jevons's "logical machine" that it "worked as well as the human brain," the truth being, as all logicians know, that that ingenious invention requires all but the purely mechanical part of the inferential process to be performed for it by the operator.

Some of these statements would possibly have been removed by the author had he lived to give the book his final revision, but others are such as could hardly have been made by a writer really acquainted with many of the subjects upon which Dr. Brinton expressed himself with confidence. No serious student of ancient history would subscribe to the assertion that the early Romans were dominated *exclusively* by the lust of conquest, or the Greeks by the love of art (p. 111), nor does a study of the erotic poetry of the Christian Middle Ages lend much support to the notion that "chivalry" was the expression of profound respect for woman as a sex, and devotion to a high ideal of monogamy (p. 173).

As a whole, the book is somewhat disappointing. It is rather a series of *obiter dicta* on the conditions of social development than a connected study. It is hard to understand the author's exact conception of the "ethnic mind." Sometimes (*e.g.* p. 25) we are told that the "group" is a "generic concept" with no "objective existence," yet again (*e.g.* p. 28) that its "actual existence" cannot be denied, and that it is related to the individual mind as the building to its component stones. Dr. Brinton held very strong opinions on some subjects of current controversy. He was, for instance, confident that monogamy was not primitive in the species, and again, that "acquired characters" are transmissible. It is a pity he—or his representatives—should have seen fit to abstain from all citation of evidence or references in dealing with such important questions.

Mr. Shann's little work is a pleasantly written and fairly thoughtful essay in support of the view which sees in scientific truth simply a set of convenient descriptive hypotheses. The "criterion" of truth he adopts is the simplicity and adequacy with which our formulæ enable us to picture a connected train of sensational experiences. Hence he lays great stress upon two points; the origin of all knowledge must be sensational, and no knowledge can be absolute or final. From the standpoint adopted he discusses various cases of the supersession of inadequate by more adequate scientific formulæ intelligently and readably, but he seems not to have realised the grounds on which many able thinkers would dissent from the empirical phenomenalism he advocates. Has he ever asked himself whether his general philosophical theories would enable him to give a reasonable account of mathematical truth? If he will reflect, for instance, on the nature of number, and the difficulties involved in the assumptions that numerical truths are of sensational origin and only relative validity, he will probably discover that there are serious gaps in the phenomenalist theory of knowledge which he advocates. There is no doubt that he has something on this point to learn from Kant, whom he does not mention at all in his historical synopsis, and possibly even more from Plato, whom he dismisses with a sentence or two of vague generality.

A. E. T.

Opere matematiche di Francesco Brioschi. Pp. 416. (Milano: Ulrico Hoepli, 1901.)

THERE could not have been a more fitting tribute to the memory of Francesco Brioschi than the publication of his collected papers in quarto form. In order to carry out such an undertaking, a committee was formed shortly after his death consisting of Profs. G. Ascoli, E. Beltrami, G. Colombo, L. Cremona, G. Negri and

G. Schiaparelli, and the result is a work of which the present is the first volume. It contains fifty-four of Brioschi's papers, of which forty were originally published during the period 1851–1857 in the *Annali di Scienze matematiche e fisiche* under the editorship of Barnaba Tortolini, and the remainder appeared in the *Annali di matematica pura ed applicata*, which formed a continuation of the previous journal, during the years 1858–1861. The last of the series is Brioschi's classical monograph on the theory of covariants and invariants of binary forms and their principal applications. The arrangement adopted has thus been to classify Brioschi's papers according to the journals in which they are published and not according to date or subject-matter.

The committee placed the principal work of editing the volumes in the hands of Profs. Beltrami and Cremona, and on the death of the former the task was continued by Prof. Valentino Cerruti, the papers in the present volume being revised in addition by Profs. Pascal, Gerbaldi, Loria, Pittarelli, Reina and Tonelli. To these names must be added those of Profs. Bianchi and Capelli in connection with the revision of material for succeeding volumes.

A photogravure portrait of Brioschi forms a frontispiece, and a short history of his life will appear at the end of the complete work, forming a lasting monument to the great Italian mathematician.

Webster's International Dictionary of the English Language. To which is now added a Supplement of 25,000 Words and Phrases. Edited by W. T. Harris, Ph.D., LL.D., Editor-in-Chief. (London: George Bell and Sons.) Price 2 guineas net.

NO more convincing proof of the extent to which the English language has been enriched as a result of the wonderful activity in scientific circles during recent years could be found than this new edition of the world-renowned "Webster." The supplement, which distinguishes this from the last edition of the dictionary, is largely composed of scientific terms and technical expressions which have come into existence during the last decade. It is only necessary to glance down a list of the names of the men of science who have assisted Dr. Harris in the preparation of this substantial addendum to satisfy oneself that the definitions will prove clear, accurate and complete. Repeated tests have shown that such anticipations are well founded, a conclusion that will not seem surprising when it is stated that among the assistants on whose services the Editor-in-Chief has been able to rely are such scientific experts as Prof. E. S. Dana, Prof. G. K. Gilbert, Dr. E. S. Holden, Dr. T. C. Mendenhall, Prof. E. L. Nichols, Prof. I. Remsen, Prof. A. E. Verrill, Prof. L. F. Ward, and many others of equal authority. The dictionary will continue to merit the confidence with which it has long been regarded.

Education and Empire. Addresses on certain Topics of the Day. By Richard Burdon Haldane, M.P., LL.D., K.C. Pp. xvi + 195. (London: John Murray). Price 5*s.* net.

IN the first two addresses in this volume Mr. Haldane is concerned entirely with educational problems, and in both of them pleads in a convincing manner for more earnest attention to the great need of increased facilities for higher technical instruction and for scientific research in this country. The comparisons which are here instituted between what is done in the United Kingdom and in Germany and the United States of North America in the matter of providing technical colleges and laboratories for scientific research should, if anything will, explain to our manufacturers and merchants the reason for the phenomenal success of our trade rivals.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

Mr. Marconi's Results in Day and Night Wireless Telegraphy.

I CAN assure Prof. Joly that his explanation (p. 199) will not do.

The observed effect, which if confirmed is very interesting, seems to me to be due to the conductivity, and consequent partial opacity, of air, under the influence of ultra-violet solar radiation.

No doubt electrons must be given off from matter (dust as well as other matter) in the solar beams; and the presence of these will convert the atmosphere into a feeble conductor. Conducting power in the sea-water surface assists and guides the waves, retaining them in two dimensions after the same fashion as a telegraph wire retains them in one; but conductivity in the dielectric itself will tend to dissipate and enfeeble the waves, by a process of reflection resulting in some amount of distortion. OLIVER LODGE.

June 27.

Kinetic Theory of Planetary Atmospheres.

IN the *Astrophysical Journal* for November, 1901, is printed a paper of mine in the first part of which a method is proposed for determining the mean temperatures of the atmospheres of the planets and those of their surfaces. In the second part of the paper an attempt was made with the use of these temperatures to determine the composition of the atmospheres of the planets by the "empiric" method proposed by Dr. Johnstone Stoney and based on the supposition that helium escapes from the earth's atmosphere. The most probable velocity of the molecules of helium is 1093 metres per second at 15° C. (the mean temperature of the earth's surface), and the velocity sufficient to overcome the earth's attraction is 11,170 metres per second. Hence it has been inferred that a gas escapes from the surface of the planet, if the most probable velocity of its molecules is 10·22 times less than that required to overcome the planet's attraction.

Prof. G. H. Bryan (NATURE, No. 1698, p. 54) has remarked that according to his and Mr. Cook's calculations, founded on the kinetic theory of gases, helium cannot escape to any sensible extent from the earth's atmosphere by the motion of its molecules among themselves. But the assumption that helium cannot be retained by the earth's attraction is arbitrary. It is possible that helium exists in our atmosphere in only a very small quantity, because it is contained in the interplanetary medium in very insignificant proportions; its escaping, if it occurs, is effected, perhaps, by ordinary diffusion. We know several substances, as thorium, osmium, &c., which are very rare minerals, though their atomic weight is great. It is possible, moreover, that even hydrogen can be retained by the earth; it seems to be confirmed by the observations of M. Gautier (*Bulletin* de la Soc. chim. de Paris, December 5, 1900, p. 884) and Lord Rayleigh (*Phil. Mag.*, vol. iii., pp. 416–422, 1902), who have found free hydrogen in atmospheric air.

Assuming the last supposition, we must substitute for the number 10·22 some other less than 7·42 ($=\frac{1505}{15^{2}\cdot 05^{2}}$, where 1505 is the most probable molecular velocity of hydrogen at 15° C.), for instance, 7, 6, or 5, in order that an appreciable number of molecules may attain the speed sufficient to carry them to infinity; and consequently table iii. in my paper must be changed correspondingly. E. ROGOVSKY.

The Coloured Sunsets.

THE recent fine weather has enabled one to observe the sunsets and after-glows under very favourable circumstances, and the most striking feature observed was the predominance of the beautiful salmon-colour tinge, which became most intense when the after-glow was brightest.

Practically none of the sunsets observed were strikingly red,